Seychelle – Flip-Top™ Straw Filter Bottle

www.seychelle.com

Device Information

The Flip-Top Straw Filter Bottle is a handheld sports type squeeze bottle. The bottle has a capacity of 0.65 L (22 oz.). The bottle contains a filter cartridge consisting of an activated carbon block depth filter that is connected to the drink spout by flexible tubing and sits near the bottom of the sports bottle. The activated carbon filter is a 6 cm long hollow-core filter with a 0.6 cm thick wall. There is a final coarse filter inside the hollow core where water exits the filter cartridge to the flexible tubing. Seychelle also offers a silver-impregnated carbon block filter for use with this device. Water flows from outside through the activated carbon block filter wall into the hollow inside, through the coarse filter and into the flexible tubing connected to the drink spout. The carbon block filter has a 2 µm pore size rating. Information provided by Seychelle claims this device removes or reduces 99.9% (3-log) *Cryptosporidium* oocysts and 99.99% (4-log) *Giardia* cysts, as well as various inorganic and organic chemical contaminants. Directions for use require the user to fill the bottle with water and squeeze to produce water. Prior to the first use the filter must be flushed with two full bottles of water to remove filter particle fines. When storing the device, Seychelle recommends the filter be flushed with a chlorine solution (2 drops chlorine to one bottle water) and allowed to dry.

Effectiveness Against Microbial Pathogens

No data was received showing the effectiveness of this product with respect to the U.S. Environmental Protection Agency (USEPA) Guide Standard Protocol for Testing Microbiological Water Purifiers (reference 1). The theory and practice of depth filtration has been widely studied and there has been significant research conducted on activated carbon block filtration (reference 2). In the absence of data specific to this device tested using reference 1, and based on general knowledge of depth and carbon block filtration, this device should be capable of consistently reducing *Giardia* cysts and *Cryptosporidium* oocysts to the required minimum log reductions stated in reference 1 (i.e., 3-log) when used as directed. It is not expected to consistently reduce bacteria (6-log) and viruses (4-log). The silver impregnated into the filter is not designed to reduce microbial pathogens in water being treated. Rather, its purpose is to inhibit bacterial growth on the filter throughout the filter's useful life. Based on general depth and carbon block filtration information, the Flip-Top Straw Filter Bottle is assigned one √ for the

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reduction of *Giardia* cysts and *Cryptosporidium* oocysts and an X for bacteria and virus reduction (for an explanation of the rating checks click here).

Table. Expected Performance Against Microbial Pathogens.

Microbial Pathogen Type	Expected Disinfection Capability	Evaluation Rating	Primary Pathogen Reduction Mechanism
Bacteria	> 6-log	X	-
Viruses	> 4-log	X	-
Giardia cysts	> 3-log	√	size exclusion
Cryptosporidium oocysts	> 3-log	√	size exclusion

Production Rate and Capacity

Inherent to the production rate and capacity of filtration devices is the quality of the raw water source. Because it is a squeeze bottle, the actual production rate is dependent on the user. The production capacity is stated at up to 380 L. However, production capacity will vary widely with raw water quality (i.e., turbidity).

Cleaning, Replacement, and End of Life Indicator

This device cannot be backwashed to remove sediment from the filter. When the device becomes unusable due to decreased production rate, the clogged filter must be replaced. The bottle can be hand washed. For practical purposes, the filter cartridges are not cleanable. The device contains no end of life indicator short of filter clogging.

Weight and Size

Dry weight	200 grams
Size (height x diameter)	25 cm x 7 cm

Cost

Flip-Top Bottle with standard filter (no silver)	$30.00
Flip-Top Bottle with silver-impregnated filter	$32.00
Replacement filter (no silver)	$15.00
Replacement silver-impregnated filter	$17.00

Device Evaluation

No data was received that challenged the Flip-Top Straw Filter Bottle against reference 1. General research on depth and carbon block filtration indicates that this device should be capable of consistently reducing *Giardia* cysts and *Cryptosporidium* oocysts. This device is not likely capable of consistently reducing bacteria and viruses. Additional treatment is necessary to remove bacteria and viruses such as adding a disinfectant (e.g., chlorine, iodine, chlorine dioxide) to the bottle prior to filtering. There is a possibility that silver can leach from the silver-impregnated cartridge filter and be consumed. Although no data was received evaluating the potential for silver leaching, it is not likely that using this device for short periods would cause any adverse health effects due to silver ingestion (reference 2). The activated carbon should remove tastes and odors. This device, like all filters with small pore sizes, is highly affected by turbid (cloudy) waters. Since the device is not able to be backwashed to remove accumulated particulates, once clogged, the filter must be replaced. There is no indicator of process failure or end of device useful life.

Advantages

- Expected to consistently provide adequate protection from *Giardia* cysts and *Cryptosporidium* oocysts, although device-specific testing data using the USEPA protocol is not available.
- No wait time prior to consumption.
- Simple and effective.
- Provides taste and odor reduction.

Disadvantages

- Not expected to be consistently effective against bacteria and viruses.
- Reduced production capacity when using high turbidity water.
- Not backwashable.
- No real-time indicator of process failure.

References

1. USEPA, 1989. Guide Standard and Protocol for Testing Microbiological Water Purifiers. *Federal Register*. 54:34067.

2. U.S. Army Center for Health Promotion and Preventive Medicine, 2005. *Technical Information Paper; Filtration in the Use of Individual Water Purification Devices*, Aberdeen Proving Ground, MD.